

WHAT IS CLAIMED IS:

1. A subterranean well system, comprising:

5 a chamber expanded within the well, the chamber having a wall made up
of multiple layers.

2. The system according to claim 1, wherein an inner one of the layers
has multiple wellbore exits formed therein prior to being expanded in the well.

10 3. The system according to claim 1, wherein the layers include an
outer shell and an inner shell.

4. The system according to claim 3, wherein the inner shell is
15 expanded in the well within the outer shell.

5. The system according to claim 3, wherein the inner shell is
displaced at least partially into the outer shell after the outer shell is expanded in
the well.

20 6. The system according to claim 3, wherein the inner shell is
expanded within the outer shell after the outer shell is expanded in the well.

7. The system according to claim 3, wherein the layers further include a hardened load bearing material positioned between the inner and outer shells.

5 8. The system according to claim 7, wherein the load bearing material is positioned between the inner and outer shells after the inner and outer shells are positioned in the well.

9. The system according to claim 7, wherein the load bearing material
10 is positioned within the outer shell after the outer shell is expanded in the well.

10. The system according to claim 7, wherein the load bearing material is hardened in the well after the load bearing material is positioned between the inner and outer shells.

11. A method of forming an expanded chamber in a subterranean well,
the method comprising the steps of:

positioning multiple chamber wall layers in the well; and
expanding the layers in the well to form the expanded chamber.

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12. The method according to claim 11, wherein the expanding step
further comprises inflating at least one of the layers.

13. The method according to claim 11, wherein the expanding step
10 further comprises expanding the layers within an enlarged cavity in the well.

14. The method according to claim 13, further comprising the step of
forming the enlarged cavity by underreaming a wellbore of the well.

15 15. The method according to claim 11,
wherein the layers include an outer shell and an inner shell, and
wherein the expanding step further comprises expanding the outer shell
and expanding the inner shell within the outer shell.

20 16. The method according to claim 15, wherein the expanding step
further comprises expanding the inner shell after expanding the outer shell.

17. The method according to claim 15, wherein the positioning step further comprises displacing the inner shell at least partially into the outer shell after the step of expanding the outer shell.

5 18. The method according to claim 17, further comprising the step of connecting the inner shell to a tubular string, and wherein the displacing step further comprises displacing the tubular string.

19. The method according to claim 15, further comprising the step of
10 hardening a load bearing material between the inner and outer shells in the well.

20. The method according to claim 19, wherein the hardening step is performed after the step of expanding the outer shell.

15 21. The method according to claim 20, wherein the hardening step is performed after the step of expanding the inner shell.

22. The method according to claim 21, further comprising the step of cementing the expanded chamber in a wellbore of the well after the hardening
20 step.

23. The method according to claim 19, further comprising the step of positioning the load bearing material between the inner and outer shells.

24. The method according to claim 23, wherein the load bearing
5 material positioning step is performed prior to positioning the inner and outer shells in the well.

25. The method according to claim 23, wherein the load bearing
material positioning step is performed after positioning the inner and outer shells
10 in the well.

26. The method according to claim 23, wherein the load bearing
material positioning step is performed after expanding the outer shell in the well.

15 27. The method according to claim 26, wherein the load bearing
material positioning step is performed prior to expanding the inner shell in the well.

28. The method according to claim 26, wherein the load bearing
20 material positioning step is performed after expanding the inner shell in the well.

29. The method according to claim 23, wherein the step of positioning the load bearing material between the inner and outer shells is performed by positioning the load bearing material within the outer shell after expanding the outer shell in the well, and then expanding the inner shell.

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30. The method according to claim 29, wherein the step of positioning the load bearing material within the outer shell is performed prior to displacing the inner shell at least partially into the outer shell.

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31. The method according to claim 23, wherein the step of positioning the load bearing material between the inner and outer shells is performed by positioning the load bearing material within the outer shell prior to expanding the outer shell in the well.

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32. The method according to claim 31, wherein the step of expanding the outer shell further comprises positioning additional load bearing material within the outer shell.

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33. The method according to claim 23, wherein the step of positioning the load bearing material between the inner and outer shells is performed by positioning the load bearing material between the inner and outer shells after expanding the inner and outer shells in the well.

34. The method according to claim 33, further comprising the step of displacing the inner shell at least partially into the outer shell prior to expanding the inner shell.

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35. The method according to claim 15, wherein the expanding step further comprises producing residual compressive stress in the inner shell and residual tensile stress in the outer shell as a result of expanding the inner and outer shells.

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36. The method according to claim 15, further comprising the step of sealing between the expanded inner and outer shells prior to positioning a load bearing material between the inner and outer shells.

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37. The method according to claim 36, wherein the sealing step further comprises forming at least first and second spaced apart seals between the expanded inner and outer shells, and wherein the load bearing material positioning step further comprises positioning the load bearing material between the first and second seals.

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38. The method according to claim 15, further comprising the step of forming at least two wellbore exits in the inner shell.

39. The method according to claim 38, further comprising the step of forming a tubular string connection on the inner shell longitudinally opposite the wellbore exits.

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40. The method according to claim 15, further comprising the step of forming at least three wellbore exits in the inner shell.

41. The method according to claim 11, further comprising the step of
10 cementing the chamber in a wellbore of the well after the expanding step.

42. The method according to claim 11, further comprising the step of positioning a load bearing material between at least two of the layers, and then hardening the load bearing material in the well.

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43. The method according to claim 42, wherein the load bearing material positioning step is performed prior to positioning the layers in the well.

44. The method according to claim 42, wherein the load bearing
20 material positioning step is performed after positioning the layers in the well.

45. The method according to claim 42, wherein the load bearing material positioning step is performed after at least one of the layers is expanded in the well.

5 46. The method according to claim 42, wherein the load bearing material positioning step is performed while at least one of the layers is expanded in the well.

10 47. The method according to claim 11, further comprising the steps of:
forming a wellbore exit in an inner one of the layers;
cutting an opening through the chamber wall at the wellbore exit after the expanding step; and
flowing cement outward through the opening and into an annulus formed between the expanded chamber and a first wellbore of the well.

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48. The method according to claim 47, further comprising the steps of:
drilling a second wellbore outward from the opening; and
securing a tubular string in the wellbore exit, the tubular string extending into the second wellbore.

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49. The method according to claim 48, wherein the flowing step further comprises flowing the cement through the tubular string and into the second wellbore.

5 50. The method according to claim 11, wherein the positioning step further comprises positioning multiple sets of the chamber wall layers in the well, and wherein the expanding step further comprises expanding each of the sets of chamber wall layers to thereby form multiple expanded chambers in the well.

10 51. The method according to claim 50, wherein the positioning step further comprises positioning the multiple sets of the chamber wall layers in the well in a single trip into the well.

15 52. The method according to claim 50, wherein the positioning step further comprises positioning the multiple sets of the chamber wall layers in the well simultaneously.

53. The method according to claim 50, further comprising the steps of:
connecting an annular barrier between each adjacent pair of the multiple
20 sets of the chamber wall layers; and

setting each annular barrier to thereby seal between the multiple sets of the chamber wall layers and a wellbore of the well.

54. The method according to claim 50, further comprising the step of displacing an inner layer of one of the chamber wall layer sets relative to an inner layer of another of the chamber wall layer sets.

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55. The method according to claim 50, further comprising the step of displacing an inner layer of one of the chamber wall layer sets along with an inner layer of another of the chamber wall layer sets.

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56. The method according to claim 11, wherein the expanding step further comprises swaging at least one of the layers outward.

57. The method according to claim 11, wherein the expanding step further comprises detonating an explosive within the layers.

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58. The method according to claim 11, further comprising the step of bonding at least two of the layers together by detonating an explosive within the at least two layers.

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59. The method according to claim 58, further comprising the step of positioning a bonding material between the at least two layers prior to the detonating step.

60. The method according to claim 11, further comprising the step of providing the layers including a load bearing material positioned between at least two of the layers.

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61. The method according to claim 60, wherein in the providing step, the load bearing material includes a hardenable polymer material.

62. The method according to claim 60, wherein in the providing step,
10 the load bearing material includes a hardenable epoxy material.

63. The method according to claim 62, wherein the epoxy material includes at least two parts, and further comprising the step of mixing the two parts in the well to harden the epoxy material.

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64. The method according to claim 60, wherein in the providing step, the load bearing material includes a hardenable latex cement.

65. The method according to claim 60, wherein in the providing step,
20 the load bearing material includes a hardenable polyurethane material.

66. The method according to claim 60, wherein in the providing step,
the load bearing material includes a hardenable polyethylene material.

67. The method according to claim 60, wherein in the providing step,
5 the load bearing material includes a hardenable metal matrix composition.

68. The method according to claim 60, wherein in the providing step,
the load bearing material includes a hardenable bonding material.

10 69. The method according to claim 60, wherein in the providing step,
the load bearing material includes a foamed material.

70. The method according to claim 69, further comprising the steps of
foaming and hardening the foamed material after the expanding step.

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71. The method according to claim 69, further comprising the steps of
foaming and hardening the foamed material prior to the positioning step.

72. The method according to claim 60, wherein the at least two layers
20 are each made of a metal material.

73. The method according to claim 60, wherein the at least two layers are each made of a composite material.

74. The method according to claim 11, further comprising the step of
5 forming at least one of the layers of a composite material.

75. The method according to claim 74, wherein the forming step further comprises impregnating a fabric material with a resin to form the composite material.

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76. The method according to claim 75, wherein in the forming step, the fabric is a carbon fiber cloth.

77. The method according to claim 75, wherein in the forming step, the
15 fabric is a woven material.

78. The method according to claim 75, wherein in the forming step, the fabric is a braided material.

20 79. The method according to claim 75, further comprising the step of crosslink catalyzing the resin in the well.

80. The method according to claim 79, wherein the crosslink catalyzing step is performed in response to heating the resin to a predetermined temperature in the well.

5 81. The method according to claim 74, further comprising the step of positioning a protective metal lining within the composite layer.

82. The method according to claim 11, further comprising the step of forming at least two of the layers of a composite material.

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83. The method according to claim 82, wherein the expanding step further comprises displacing the composite layers relative to each other.

84. The method according to claim 82, further comprising the step of
15 positioning a protective metal lining within the composite layers.

85. The method according to claim 82, further comprising the step of positioning a foamed material between the composite layers.

20 86. The method according to claim 11, further comprising the step of forming at least two of the layers of a metal material.

87. The method according to claim 86, further comprising the step of bonding the metal layers to each other after the expanding step.

88. The method according to claim 87, wherein the bonding step
5 further comprises setting a bonding material between the metal layers.

89. The method according to claim 86, further comprising the step of interlocking the metal layers to each other after the expanding step.

10 90. The method according to claim 86, further comprising the step of welding the metal layers to each other.

91. The method according to claim 90, wherein the welding step is performed prior to the positioning step.

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92. The method according to claim 86, further comprising the step of bonding the metal layers to each other by detonating an explosive proximate the metal layers.

20 93. The method according to claim 11, further comprising the step of forming at least one of the layers of a rubber material.

94. The method according to claim 93, wherein the forming step further comprises impregnating a fabric with the rubber material.

95. The method according to claim 93, wherein the forming step
5 further comprises coating a fabric with the rubber material.

96. A wellbore junction for use in a subterranean well, the wellbore junction comprising:

a wall made up of multiple layers expanded in the well.

5 97. The wellbore junction according to claim 96, wherein at least one of the layers is made of a metal material.

98. The wellbore junction according to claim 96, wherein at least two of the layers are made of a metal material.

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99. The wellbore junction according to claim 98, wherein the metal layers are bonded to each other.

100. The wellbore junction according to claim 98, wherein the metal
15 layers are welded to each other.

101. The wellbore junction according to claim 98, wherein the metal layers are interlocked to each other.

20 102. The wellbore junction according to claim 98, wherein the metal layers are bonded to each other by an explosive shock wave produced by an explosive detonated proximate the metal layers.

103. The wellbore junction according to claim 98, further comprising a hardenable material positioned between the metal layers.

5 104. The wellbore junction according to claim 103, wherein the hardenable material is a bonding material.

105. The wellbore junction according to claim 103, wherein the hardenable material is a metal matrix composition.

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106. The wellbore junction according to claim 103, wherein the hardenable material is a polymer material.

107. The wellbore junction according to claim 103, wherein the
15 hardenable material is an epoxy material.

108. The wellbore junction according to claim 107, wherein the epoxy material includes at least two parts, and wherein the two parts are mixed in the well to harden the epoxy material.

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109. The wellbore junction according to claim 103, wherein the hardenable material is a latex cement.

110. The wellbore junction according to claim 103, wherein the hardenable material is a polyurethane material.

5 111. The wellbore junction according to claim 103, wherein the hardenable material is a polyethylene material.

112. The wellbore junction according to claim 103, wherein the hardenable material is a foamed material.

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113. The wellbore junction according to claim 96, wherein at least one of the layers is made of a composite material.

114. The wellbore junction according to claim 113, wherein the
15 composite material includes a resin impregnated fabric.

115. The wellbore junction according to claim 114, wherein the fabric is a carbon fiber cloth.

20 116. The wellbore junction according to claim 114, wherein the fabric is a woven material.

117. The wellbore junction according to claim 114, wherein the fabric is a braided material.

118. The wellbore junction according to claim 114, wherein the resin
5 catalyzes at a predetermined temperature in the well.

119. The wellbore junction according to claim 114, wherein the resin crosslinks at a predetermined temperature in the well.

10 120. The wellbore junction according to claim 113, further comprising a protective metal lining positioned within the composite layer.

121. The wellbore junction according to claim 96, wherein at least two of the layers are made of a composite material.

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122. The wellbore junction according to claim 121, further comprising a foamed material positioned between the composite layers.

123. The wellbore junction according to claim 96, wherein an inner one
20 of the layers has residual compressive stress therein, and wherein an outer one of the layers has residual tensile stress therein.

124. The wellbore junction according to claim 96, further comprising a pressure relief valve in the wall.

125. The wellbore junction according to claim 124, wherein the pressure
5 relief valve permits a hardenable material positioned between the layers to flow out from between the layers when the hardenable material reaches a predetermined pressure.

126. The wellbore junction according to claim 96, wherein at least one of
10 the layers is made of a rubber material.

127. The wellbore junction according to claim 126, wherein a fabric is impregnated with the rubber material.

128. The wellbore junction according to claim 126, wherein a fabric is
15 coated with the rubber material.

129. A wellbore junction for use in a subterranean well, the wellbore junction comprising:

a wall made of a single layer of composite material.

5 130. The wellbore junction according to claim 129, wherein the composite material includes a resin impregnated fabric.

131. The wellbore junction according to claim 130, wherein the fabric is a carbon fiber cloth.

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132. The wellbore junction according to claim 130, wherein the fabric is a woven material.

133. The wellbore junction according to claim 130, wherein the fabric is
15 a braided material.

134. The wellbore junction according to claim 130, wherein the resin catalyzes at a predetermined temperature in the well.

20 135. The wellbore junction according to claim 130, wherein the resin crosslinks at a predetermined temperature in the well.

136. The wellbore junction according to claim 129, wherein the composite material includes a rubber impregnated fabric.

137. The wellbore junction according to claim 129, wherein the
5 composite material includes a rubber coated fabric.